REPORT

UPON THE

YELLOWSTONE NATIONAL PARK,

TO THE

SECRETARY OF THE INTERIOR,

BY

P. W. NORRIS,
SUPERINTENDENT.

FOR THE YEAR 1879.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1880.

a. Basaltic Cliffs b. Falls of the East Gardiner c. Headquarters of Superintendent d. Mt Washburne e. Liberty Cap f. McCartney's Buildings g. Devil's Thumb h. Hot Spring Terraces.

MAMMOTH HOT SPRINGS, YELLOWSTONE NATIONAL PARK. WY. TER.

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REPORT

UPON THE

YELLOWSTONE NATIONAL PARK.

WASHINGTON, *January* 16, 1880.

SIR: I have the honor to submit for your approval, and for publication, my third annual report of operations for the protection, preservation, and improvement of the Yellowstone National Park, during the season of 1879.

Vexatious delays and loss for want of various articles not obtainable near the park prompted my purchasing a steel reversible or side-hill plow, and other tools and implements, mainly in Detroit, and forwarding them to Bismarck for shipment upon the first steamboat to ascend the Yellowstone River, myself following them from Detroit May 12.

At Bismarck, fortunately failing to connect with the steamer Yellowstone (which was lost upon that trip at Buffalo Rapids), I shipped with my outfit up the Missouri River direct to Fort Benton, and thence, after forwarding it by a freighter, pressed on via Helena to Bozeman. I there organized my field party with C. M. Stephens as assistant, and with wagons and horsemen pressed forward 80 miles, reaching the Mammoth Hot Springs, in a terrific rain and sleet storm, June 12, being just one month in making some 3,000 miles by the various modes of travel and circuitous route necessarily taken.

The purchase of an excellent four-mule team, wagon, harness, &c., complete, some additional saddle and pack animals, and increasing my party to its maximum of thirty men, enabled me to speedily construct a rough log building upon the McCartney Creek for temporary use as storage and cook-room, and push inclosures for a pasture for the safety of our animals. In canvas wagon-cover wings to our house, several tents, and a lodge, we made ourselves as comfortable as possible during the remainder of the stormiest June which I ever experienced in the Rocky Mountains. This not only greatly retarded our operations in the park, but also seriously delayed and increased the expense of obtaining supplies, and rendered the roads to Fort Benton so nearly impassable that our outfit forwarded from there June 2 was only obtained by sending on other teams over 100 miles for it in the middle of July.

As shown by the sketch of the Mammoth Hot Springs and vicinity, our headquarters is upon a commanding natural mound, in a deep sheltered park of erosion, at the confluence of the three branches of the Gardiner River. Each of these descends by a succession of rapids, cascades, and cataracts, in a yawning cañon through basaltic terraces, some 2,000 feet within a distance of 4 miles, and discharging through a similar cañon, in a like distance, to the initial point of the boundaries of the park at its confluence with the Yellowstone River just below its third cañon. A portion of the cañon of the main Gardiner, and all of those of the west and middle branches, are utterly impassable for even

a bridle path. The only routes, therefore, to and from our headquarters are, first, a very rough and difficult one, over two dangerous fords—now bridged—near the forks, and past a cascade and two cataracts upon the east branch to the forks of the Yellowstone—distance, 20 miles; second, over my road of last year up the dry pass between the hot-springs terrace and Sepulchre Mountain to the geysers—distance, 60 miles; and, third, by the old road, over the mountain spurs and rugged cañons, 6 miles to the Yellowstone River, and through its second cañon and Bozeman's Pass over the Gallatin Range to Fort Ellis and Bozeman's—distance 80 miles. The summit of a natural mound some 600 feet in length, 300 feet in width, and 150 feet high, smoothly eroded for a carriage-way at each end, and a depression for a reservoir near the summit, after mature deliberation and sustained by the unanimous approval of the experienced mountaineers, I selected as the site for our block-house headquarters, where it fully commands the entire mound, valley, and terrace, within range of rifle or field artillery, and a fair view of the entire balance of the valley and all its approaches.

The water from not only all the upper hot-spring terraces, but also the McCartney, Bluff, and other cold creeks, sinks in the open cone and cavern-dotted geyserite plateau around this mound, only to burst forth a fair-sized mill stream of hissing, hot, medicinal water, just below the surrendered McGuirk block and bath houses upon the main Gardiner, some 2 miles distant, and 1,000 feet below the foot of the active terrace springs. As the rim of towering basaltic cliffs along the main Gardiner and its branches, together with the ancient and active hot-spring terraces, so nearly inclosed our building mound, the McGuirk Springs, the road between them, and 15 or 20 square miles of sheltered pasturage, that some two miles of fencing would complete the inclosure, the plan was unhesitatingly adopted. With pine, fir, and cedar material hauled from the ancient hot-springs terrace, a genuine Montana fence, *i. e.*, with posts sustained at an angle of some 60 degrees by smaller posts or legs through holes near the top, surmounted and faced by poles pinned or spiked horizontally upon them, was, through all obstacles, pressed to completion July 12, and in convenience and safety has not only already repaid cost, but is doubtless the largest and most sheltered, as well as romantic and valuable, pasturage for the cost of its inclosure now or ever owned by the nation in the mountains. Meanwhile we had planted an experimental garden of some half acre of potatoes, turnips, and other hardy vegetables, below the McGuirk Hot Springs, and by an occasional irrigation from them during the continuous dry weather after July 1, and some frosty nights after August 15, were far more successful in production than in protection from vandalism at a place so remote and hidden from our block-house, nearer which I have chosen and am fencing a site for our future hardy vegetable garden.

The old sheep and Sheep-Eater Indian trail from the mouth of the Gardiner River passed around the impassable portion of its cañon, then into and followed it to near the McGuirk Springs, and around the pine and cedar-clad border of the lower dry terrace and geyserite plateau to Liberty Cap; while the old wagon road wound around the basaltic spurs and terraces of Sepulchre Mountain, descending by a rough and dangerous way many hundreds of feet to the same point at the foot of the active hot springs. These were, as before stated, the only routes from Bozeman, and they barely passible, with immense expense unavoidable to ever render either of them passable coach-roads, never convenient or safe ones, and hence I have expended little money upon them, but have

for years been improving every opportunity in exploring, examining, and finally engineering a roadway across countless spurs and gulches along the mountain side midway between them. In this I finally succeeded, and, without sharp curvatures, carried a line of easy grades for some 3 miles, and, with only a moderate amount of bridging, constructed a road much shorter and in all respects superior to what could have ever been made upon either of the other routes at manifold its cost. This greatly facilitated the hauling of supplies and building material from Bozeman, and by hewing the timber and making the shingles upon the mountain terraces and hauling them to the site upon the mound, we had, during July, erected in first-class manner a block-house 40 by 18 feet, two tall stories high, with, for use as well as safety from mountain storms, substantial block-house leantos or wings upon three of the sides, and an 8-foot balcony to both stories of the other fronting the active hot-spring terraces. Upon the main building is an octagon turret or gun-room, 9 feet in diameter and 10 feet high, well loopholed for rifles, and all surmounted by a national flag 53 feet from the ground, upon a fine flag staff or liberty-pole passing from a solid foundation through and sustaining all the stories, turret, and roof thereof. During these operations small parties of horsemen, with pack-animals, had vainly sought for Indians or serious vandalism by tourists; but removed fallen timber and otherwise improved the road and main bridle-paths to the geysers, and in assisting tourists, some of whom had tunneled through huge snow-packs upon the spur of Mount Washburn in June, and in constructing a reservoir fronting our mound; we improved the last day of July in removal to our unfinished house upon it.

Leaving my assistant, C. M. Stephens, with a small force laboring upon our house, I, upon the 1st day of August, with our main party of laborers and animals, and three wagons loaded with tools, tents, provisions, and other outfit, ascended the terrace pass upon our last year's road to the geysers, accompanied by some horsemen and one wagon-load of Idaho tourists. Immense quantities of fallen timber were removed, culverts and bridges repaired, new ones constructed, and grades, especially at Obsidian Cliffs, Norris Plateau, and Gibbon's Cañon, greatly widened and improved to the junction with the road to Henry's Lake and Virginia City, and similar improvements across the Gibbon, and through the upper cañon of the Madison to at least the western borders of the park near Taughees Pass. Through this I alone passed to the summer military post at the head of Henry's Lake and Hickman's camp of Virginia City tourists in the Red Rock Pass. Returning to my party, we improved the roads up the Madison and the Fire Hole Rivers to Mary's Lake and the Upper Geyser Basin; meanwhile the field party of Mr. R. J. Reeves for surveying the border-line of Wyoming and Montana had, under the guidance of a military escort from Fort Washakee in the Wind River Valley, unwisely left the Big Horn and Stinkingwater route as planned, and where I had guides awaiting them, and in attempting the Two Ocean Pass without guides became lost, scattered, and seriously delayed, and, though Messrs. Reeves, Dane, and McCrary, after weeks of toil, privation, and danger, succeeded in reaching the Mammoth Hot Springs via the Yellowstone Lake and Falls, still his escort and outfit became so bewildered and delayed in the swamps and tangled timber gulches near Bridger's Lake, that only the timely assistance of myself and scouts—Yellowstone Kelley, Johnson, and Manning—found and led them via Shoshone Lake to our camp at the Upper Geyser Basin. In this and other scouting expeditions much valuable knowledge was obtained of the precipitous densely timbered regions bordering the Yel-

lowstone, Hart, Lewis, and Shoshone Lakes upon both the Atlantic and Pacific slopes of the main divide, which at this point is peculiarly tortuous, but no direct route across it from the Upper Fire Hole Basin to the Yellowstone Lake. The evident necessity of such a route has, from the commencement of explorations within the park, led to greater efforts and more failures than any other trail seeking within it, and the discovery of such a route was one of the main features of my season's plan. Hence, leaving my party engaged in constructing a loopholed, earth-roofed log-house and other improvements in the Upper Geyser Basin, I, alone, or with only one scout, commenced searching for a route, during which I found the odometer left in 1873 by Captain Jones and Professor Comstock, upon the nearly vertical face of the main divide overlooking Shoshone Lake, where seemingly only Noah's Ark or Bridger's famous foraging crow would have ever left or be likely to remove it, and amid the dense snow-crushed, storm-twisted, knotted and gnarled thickets of the continental divide, traces of Everts, Hayden, and other explorers, but no practicable route across it, and returned to the Fire Holes.

Thus baffled as had been all previous explorers, I, as a last effort, ascended the north bank of the Fire Hole River, past a succession of enchanting rapids, cascades, and cataracts, and after some days of excessive exposure and hardship, and nights of sleepless cold and anxiety, was rewarded by more than hoped-for good fortune in tracing a chain of small mountain and timber-hidden parks, and lovely lakelets, to a narrow timber-hidden, but deep, direct, and excellent pass, which within less than 2 miles crosses, or rather cuts, the main divide from the Fire Hole waters of the Atlantic to a sheltered grassy park near Shoshone Lake, and the spring and rivulet fountain-heads of the Columbia of the Pacific. With buoyant hopes I sought a similar pass in the opposite bend of the divide, but finding none nearer than Lewis Lake, I ascended it by a somewhat zigzag but not difficult route, and within 5 miles reached the summit near one of those crater-like ponds or noted Two Ocean Lakes, without outlet, and by similar grades descended the eastern slope. Reached the Yellowstone Lake at the western end of its great thumb, near the hot spring terraced beach, famous as convenient for catching the large lake trout, and without changing one's position or removal from the hook, thoroughly cooking them in nature's boiling pots within one and a half minutes from the time they were sporting in the crystal waters of the lake, as I have for years by actual experiment demonstrated to the incredulous. Returning, I opened a trail from the cascades to Old Faithful, at the head of the upper Fire Hole Basin, there finding several parties of tourists. One of these, including the wife of Postmaster Taylor, Mr. McAdow, a prominent miller, and several youthful members of the families of General Willson and other leading citizens of Bozeman and the Gallatin Valley, is deemed worthy of special record; as, though many ladies had for years visited the geysers upon horseback, and the Smith and Woodworth party, with ladies, had recently visited them in wagons from Virginia City, these were the first ladies to reach Old Faithful by wagon upon our road from Bozeman, and who upon horseback—August 27—were positively the first ladies who, by any mode or route, ever visited the cascades of the upper Fire Hole River, 3 miles above Old Faithful. Leaving my excellent trainmaster, J. E. Ingersoll, in charge of the main party, with instructions to complete our building and then improve the roads in returning with the wagons to the Mammoth Hot Springs, I, with six picked mountaineers and a small pack-train, opened the recently explored route an estimated distance of 10 miles to Shoshone Lake, and 12 additional, or in the aggregate 22 miles

from the Upper Fire Hole, twice across the continental watershed, to Yellowstone Lake. Thence I opened a trail, much of the way through fallen timber, along or near the western shore of Yellowstone Lake some 26 miles to its outlet, and improved the old one some 60 miles via the Mud Volcano, Sulphur Mountain, Great Falls, Cañon, and Forks of the Yellowstone, Mount Washburn, Tower Falls, and cañon of the East Gardiner, to our headquarters upon the mound September 7, finding our wagon train safely returned. Thus, after an absence for most of the party of 38 days of nearly continuous good weather and active and successful operations, without seeing an Indian or losing a man, and, from experience, using camp and pocket filters for bad or unknown water, but no alcoholic stimulants, all returned in excellent health, with no mishap greater than having some of our men and horses for a time lamed by scalding in the fire-holes, and having one of the latter, when thus crippled, devoured by grizzlies. Aside from a fair supply of bacon, trout from the cold springs, not mineral, the flesh of deer, elk, antelope, bear and other animals, and birds killed with the rifles, were our only, but excellent and ample, supply of animal food.

The limited appropriation under my control not justifying continued employment of so large a party, I regretfully discharged many excellent men to whom, from jointly sharing toil and camp-fire, I had become greatly attached and whom I would gladly and profitably have retained.

SCIENTIFIC SPECIMENS.

During the entire season's operations I had carefully—often with great effort and hazard in cliff and cañon climbing—secured rare and interesting specimens from the various geysers and other hot spring formations, obsidian cliffs, fossil forests, and Sheep-Eater haunts, intended for the Smithsonian Institution and the Anthropological Society of Washington, and other scientific associations. These, after carefully packing in five boxes, were securely bound with rawhide thongs, and in September, sent from the Gate of the Mountains upon the Yellowstone by some men who were returning from my employ to the States in a small Mackinaw boat. But, unfortunately, they were, in the unusual low stage of water, wrecked at the Buffalo Rapids; and, though it was reported that these specimens were landed, I have failed to obtain reliable information regarding them, and greatly fear their total loss to science and the world.

GUIDE-BOARDS.

The original cost of lumber and added heavy freightage, nearly 80 miles from Bozeman, precluded the use of more than was absolutely necessary. But all fragments were carefully preserved, well dressed, painted white, and then black-lettered with the names of the most important streams, passes, geysers, &c., and tables of distances between them. These were carried by wagon, pack-train, or on horseback, and firmly affixed to rocks, trees, or durable posts, proving of great value to tourists throughout the park; but many more are needed.

Leaving a small force building a corral and bridging the Gardiners near their forks, I, with the rest of the party, spent the remainder of September in improving the trail past the forks of the Yellowstone, 35 miles to the Soda Butte, and making a new one across Amethyst Mountain and the Fossil Forest, some 30 miles to Pelican Creek and the foot of Yellowstone Lake. Returned, outfitted, and having completed a very necessary bridge over Tower Creek above the falls, was actively open-

ing a trail between the Grand Cañon and Mount Washburn when the unseasonably severe snow-storm of October 9 compelled suspension of important field operation for the season, and, leaving some of our tools, we gladly pushed, in a terrific storm and through dangerous snow-drifts, to our excellent headquarters at the Mammoth Hot Springs. Although the snow soon melted in the lower valleys, and mainly so around our Hot Springs, still it continued too deep and the weather too stormy in all the mountain passes for profitable or even safe employment of laborers, and few were retained, the remainder of the autumn being spent in exploration of the park, including a thorough reconnoissance of the gold, silver, lead, and copper mines in the Montana portion of the park, in hauling our winter supply of provisions, forage, and fuel, and sketching and mapping our building site—the hot-spring terrace and surroundings.

In exploring routes, and hunting, killing, and packing game into camp, often through dense thickets of fallen timber, fire-hole basins, or yawning cañons, the hardships, dangers, and exposure to broiling sun and biting frost, or lonely camp-fire in unknown snowy regions, were ever chosen as pastime by our mountaineers, and the attendant incidents of such trips, including the nimble dodge from a wounded buck, or hasty tree-climbing from a ferocious grizzly, forms the standing basis for camp-fire stories or legends of the days agone. Such romance and enjoyment this season was, for the first time in the park, unalloyed by Indian raids or serious accidents or mishaps; but, as of little general interest, seldom mentioned in my reports or letters. But, of the animals killed during the past season, were some very large and fine elk, deer, sheep, and antelope, and a mountain lion, shot in the night to prevent his molesting our animals, which measured nearly 9 feet in length from lip whiskers to tip of tail, and the last of the six grizzlies killed by myself during the past season, was a remarkably large and fine one. A fine young horse, somewhat lamed by scalding in the fire holes, having been left near Obsidian Cañon, was killed by a grizzly, that, in devouring the carcass and fragments of game killed in the vicinity, continued to haunt the place. In trailing him in snow nearly knee deep some weeks afterwards, I killed two large antlered elks, but a few yards apart, and, it being nearly night, I only removed their entrails and camped alone near them, confident that bruin would visit them before morning. I then found that he had dragged the elk so near together as to leave only a space for a lair of boughs and grass between them, which he was intently finishing, when I, at a distance of 100 yards, opened fire with a Winchester rifle with fourteen ordinary bullets in the chamber and a dynamite shell—being all which I dared to use at once in the barrel. This I first gave him high in the shoulder, the shell there exploding and severing the main artery beneath the backbone. He fell, but instantly arose with a fearful snort or howl of pain and rage, but got four additional ordinary .44 caliber bullets in the shoulder, and nearly as many falls before discovering me, and then charged. Hastily inserting another dynamite shell, I, at a distance of about 50 yards, as he came in, sent it through his throat into his chest, where it exploded and nearly obliterated his lungs, again felling him; and as he arose, broke his neck with the seventh shot. Either one of these would have stiffened any other animal, and surely have soon proved fatal to him; but deeming delays just then dangerous, I peppered him lively. Finding Stephens across Beaver Lake, we returned with our saddle and pack animals, and after killing a pair of wood martens that were preying upon the carcasses, we dressed the animals, packing all possible of them 20 miles to our block-house at the Mammoth Hot Springs. We there found

the hide of the bear just as spread out, without stretching, to be 8¾ feet long from tip of snout to roots of tail, and 6 feet 7 inches at its widest place; and from his blubber brought in, Stephens tried out 35 gallons of grease or oil. Its extraordinary size is the only reason for at all mentioning the animal in this report.

As the geyser regions are nearly unknown in winter, I had constructed our comfortable log-house in the little grove between the castle and the Beehive Geysers in the Upper Fire-Hole Basin, with a good stone chimney and provided abundance of fuel, proposing to remain there, obtaining much valuable information and sketching them and the lake regions in winter, and during it returning via Henry's Lake to Camas Station upon the Utah Northern Railroad. But finding the sulphur-charged condensed steam and fogs of the Geyser Basin were too suffocating to long endure, and that the unusual deep snows had seriously blocked the passes and gorged the Madison and other streams in their cañons, the project was reluctantly abandoned; and, returning to the springs, final arrangements for winter were made. I then left my ever-faithful and efficient assistant, C. M. Stephens; my son, A. F. Norris; and J. Davis to occupy the house upon the mound, finish the upper floors and partitions during bad weather, and, when favorable, prepare for division-fences and bridges for next season, make a snow-shoe trip to the geysers during the winter and carefully protect the game from wanton slaughter.

As no white men have ever spent the entire winter at the Mammoth Hot Springs, it is not certain that more than the saddle animals, for which we have a corral and forage, could safely remain there, and hence the mule team will be partially wintered at Cedar Creek in the second cañon of the Yellowstone, in charge of some reliable men who will, as usual, there winter their own. I then proceeded to Bozeman, closed the season's outfitting business, provided for occasional mails to the men in the park, and thence to Beaver Cañon at the terminus of the Utah Northern Railroad, and via Ogden to Cheyenne. Thence, after pleasant interviews with Governor Hoyt, the present and the ex-Delegate, and other officers of Wyoming Territory, and also prominent railroad officials in Cheyenne and Omaha, in reference to railroad, post, and coach routes and other matters of interest to the park, took the usual railroad route of return.

EXPLORATIONS.

While, by the language of the act appropriating funds, as well as my instructions for its expenditure, protection and improvement of the Yellowstone National Park appear more prominent than its explorations, still, practically, considerable of the latter is indispensable for an intelligent and judicious performance of the former; the real danger, indeed, being a deficiency rather than an excess of knowledge of the local peculiarities of that wonderful region prior to expenditure upons buildings, roads, bridle-paths, and other permanent improvements. Yet with the small amount of funds under my control for the vast improvements necessary to enable the prominent men of our nation to conveniently visit and personally judge of its wonders, its necessities, and its management, I have pushed improvements, devoting less time and funds to exploration than desirable to myself, or, I fear, ultimately the most beneficial to the park. Still, our carefully kept records of weather, long observance of storms, earthquake shocks (of which there was only a slight one, during August of the past season), formations, eruptions, and decadence of geysers and other hot springs, changing terraces and other phenomena, rapidly accumulates valuable information of the local climate and pecu-

liarities, which, with constant vigilance in the management of foraging and other expeditions, steadily adds to our knowledge of the approaches to, and routes of travel throughout, the park. In addition to the exploration of the new route down the Gardiner River, and the Shoshone route to the Yellowstone Lake, heretofore necessarily mentioned, others of interest and value have been made during the past season. As not before suspected, although within 3 miles of our block-house, the lower of the three falls of the East Gardiner has, like the famous Minnehaha, a clear safe passage between the sheet of descending water and the wall rock. In excavating for our cellar, on the mound near the Mammoth Hot Springs, we unearthed a circular deposit of several bushels of beautiful white bead-like shot or pebble specimens, some of which I have brought away to learn if they are the petrified eggs of some ancient reptile, or, as I am inclined to believe, the berries of juniper or cedar, doubtless long antedating those of Solomon, from Lebanon.

RUSTIC FALLS.

Another of the season's discoveries is a rustic fall upon the West Gardiner, near the summit of nature's rocky fence to our pasturage. This small snow-fed stream, from its bridge on our road to the geysers, flows quietly through a grassy margin in an open sage plain nearly a mile to its border, and then glides some 40 or 50 feet down a mossy rock, so smooth, so placid, and so noiselessly as to present to one standing afoot or astride, as can easily and safely be done upon its very margin of mist-nourished ferns and flowers, a contrast unique and matchless, to the succeeding 1,500 feet of its dashing, foaming descent adown a yawning cañon waterway, in magnitude out of all comparison to that now flowing there. In the open valley above are the decaying lodge-poles of an old Sheepeater camp, and upon a timbered ledge overhanging these falls, are decaying poles, driveways for game, and coverts for concealment in using arrows.

CAÑON AND FALLS OF THE MIDDLE GARDINER.

The main falls upon the middle, and far the largest fork of the Gardiner, has a clean vertical descent of near 200 feet, and the basaltic cliffs for miles tower nearly or quite vertically, often in church-like battlements and spires, from 1,000 to 1,500 feet above the foaming white torrent at the cañon's base, scenery second only to that of the Grand Cañon of the Yellowstone within the park, and seldom rivaled elsewhere.

After several failures, I this season succeeded in finding a route along the terraced base of Bunson's Peak, overlooking this cañon. This, with little increase of distance, strikes our road to the geysers, some 7 miles from our block-house, a route well worthy of and, I cannot doubt, destined to soon be occupied by a tourist's carriage-way.

SHEEPEATER HAUNTS.

This cañon, above as well as below the main falls, had been, by us, deemed inaccessible until during the early snows of last autumn, when I, alone, in trailing a wounded bighorn, descended a rocky, dangerous pathway only, in rapt astonishment, to find, by the scattered fire-brands and decaying lodge-poles, that I had thus, unbidden, entered an ancient and but recently deserted, secluded, unknown haunt of the Sheepeater aborigines of the park. It was fully a half mile in length, some 400 feet at

its greatest width, and very much deeper, and so hemmed in and hidden by the rugged timber-fringed basaltic cliffs of a spur of Bunson's Peak, that accident, or the trailing of men, or, as I did, of animals, would have ever led to its discovery. Within it are terraces of ancient hot springs and crumbling cones of extinct pulsating geysers, similar to, only much smaller than, those of the Mammoth Hot Springs and Liberty Cap below; also some active hot springs. But it is mainly carpeted with short grass, dotted, fringed, and overhung by small pines, firs, and cedars, and with the subdued and mingled murmur of the rapids and cataracts above and below it and laughing ripple of the gliding stream is truly an enchanting dell; a wind and storm sheltered refuge for the feeble remnant of a fading race, who, from evident traces, have certainly hidden here since we have occupied the Mammoth Hot Springs in utter ignorance of their proximity, although less than 6 miles distant. As only with difficulty and danger horses can descend into this and similar dells, or, for want of pasturage, long remain in them, as well as from the numerous pole drives for animals and bush screens for silent arrow shooting, often found in the park, it is evident that these harmless hermits, these "wild men of the mountains," were, until very recently, destitute alike of horses and of fire-arms. The nearly as ragged as beaver-gnawing stone or obsidian knife and hatchet marks upon decaying lodge and wickeup-poles, as well as upon ancient charred semi-petrified timber, prove they were also destitute of steel or iron tools and implements, and that, as we still do, they often used charcoal for fuel to avoid betrayal of their hidden camps by smoke; and the constantly discovered decaying evidences of lodge and wickeup or cliff-sheltered bush-houses, in the hidden glens and recesses of the mountains, indicate that, even recently, their numbers greatly exceeded the usual estimate of 100 of these peculiar people. Although so timid and harmless, when destitute of horses, fire, and other arms, and vices of white men, they have, with them, developed into as dexterous horse-thieves and dangerous cliff-fighters as any other clan of the Bannocks or Shoshones, from whom they seem to have been ancient offshoots, or occasional refugees. Indeed, it seems probable that some of the guides in Joseph's Nez Percés' raid, and certain that many of the Bannocks of last year, were native hermits of the park, far less anxious for hair than horses, and their tell-tale guns, though more efficient, less safe than their obsidian-headed spears and arrows, not allowing them to remain there in concealment from our frequent and usually fruitless pursuits of them. But they have desperately fought the miners in the Salmon River Mountains during the past season, and only our well-known preparation for their obtaining more lead than horses, and the summer military camp at Henry's Lake, prevented their seriously annoying tourists within the park.

CROW INDIAN RESERVATION OR CONFLICTING BORDERS.

From the foregoing sketch of the Sheepeater Indians, it is evident that they who so silently vanished without a contest for possession or a treaty for the cession of their ancient haunts were ever a harmless race of cliff-climbers, dwellers in caves, in lodges, or in bush-wickeups, in secluded parks and glens of the mountains, and nearly destitute of horses and fire-arms, while even those called Mountain Crows—as distinct from those upon the Missouri—have long been well supplied with both horses and fire-arms; are splendid horsemen, crafty horse-thieves, and able, determined warriors, in defense of their hereditary buffalo

range upon the plains and valleys of the Bighorn and the Yellowstone below the mountains. Hence, the natural and ever-recognized border of these clans was the elevated, remarkably rugged, unbroken snowy range from near Pilot Knob through the great bend of the Yellowstone to its first cañon, or gate of the mountains. This range the Crows seldom crossed, never occupying the slope toward the park or claiming ownership, save as under the conditions of a treaty with them made at Fort Laramie, May 7, 1868, when, doubtless for convenience in an unknown region, the Yellowstone River was followed up to its crossing of the 45th parallel of latitude, and thence eastward along its between the Territories of Montana and Wyoming as its southern border, and including some of these Sheepeater lands.

Upon this portion of the Crow Reservation were the well-known Emigrant Mines, the owners of which continued to be viewed and treated by the Crows as they were received in 1864, not as intruders, but as welcome friends and allies against their common foes, the Blackfeet, Sioux, and other hostile Indians, and have never been molested.

The miners upon the Bear and Crevice gulches, and subsequently those of Soda Butte and Clark's Fork, also upon the Sheepeater lands, like those of Emigrant, have never been molested by the Crows, and like them, with seeming reason, claim the want of original ownership and continued immunity from molestation by the Crows as acquiescence by them in the miners' rights or claims.

March 1, 1872, or nearly four years after this Crow treaty had been confirmed, the Yellowstone National Park was dedicated, fixing its northern border, not on the 45th parallel or upon the southern line of the Crow Reservation, but, in ignorance of where that line would really prove to be, fixing the confluence of the Yellowstone and the Gardiner Rivers as the initial point. This complication of rights, boundaries, and jurisdiction becoming more evident with occupancy and management of the park, I, after two ineffectual efforts in my annual reports for a remedy (see pages 9 and 10 of my report of 1877, and page 9 of that of 1878), addressed a letter as follows:

WASHINGTON, D. C., *February* 18, 1879.

SIR: I have the honor to respectfully present the following reasons for the speedy survey of the boundary line between the Territories of Wyoming and Montana.

First. Those usual for judicial and other purposes for contiguous regions.

Second. For the protection and management of the Yellowstone National Park, especially at its headquarters and main route of access to adjacent settlements, mining camps, tourists, and trappers, evidently difficult, if not impossible, without its boundaries at that point, and the operations of its necessarily anomalous rules and regulations being known by all parties. Should this Territorial line be found not identical with that of the park as now dedicated, it will be near enough for all practical purposes until further legislation can make it so, thus obviating much present and future complication and expense.

Third, and perhaps most pressingly important, fixing the southern border of the Crow Indian Reservation. As the Crows are, and ever have been, our firm friends, as well as valuable allies upon several recent critical military occasions, the necessity is evident and urgent that the proposed border line be soon run, to prevent the threatened incursion of white ranchmen upon the Big Horn and Little Horn Rivers, the finest game, grazing, and agricultural portion of their reservation (where alone they can ever be concentrated and civilized), and for want of which proposed line there is *certainty* of grave and costly complications and *danger* of a future Indian war.

Most respectfully, yours,

P. W. NORRIS,
Superintendent of the Yellowstone National Park.

Hon. J. A. WILLIAMSON,
Commissioner of the General Land Office.

This letter was promptly indorsed by the honorable Commissioner of the General Land Office, of Indian Affairs, and Secretary of the Inte-

rior, submitted by the Speaker of the House of Representatives, an appropriation made for its survey, and the western and most important portion completed by Mr. R. J. Reeves before winter. This survey clearly shows that the park, as dedicated, embraces a 2½-mile strip of Montana, which, from the crossing of the Yellowstone River easterly, had been for nearly four years embraced by the Crow Indian Reservation, and also, as just shown, mainly occupied by miners, who had quietly dispossessed the original Sheepeater owners, and under their claims of possession are steadily proceeding in development of the mines by prospecting, organizing mining districts and companies, sinking shafts, constructing arastras and smelting-works, and purchase and sale of property as openly as in any other mining region of our country, and doubtless interesting distant capitalists who are mainly ignorant of these complications of jurisdiction and ownership.

Unquestionably treaties should be solemnly observed, or by mutual agreement promptly modified, and laws strictly enforced until properly repealed; and in this case, where the real priority of rights and jurisdiction is so evident and rival interests so diverse in character and purposes, it is hoped that an amicable adjustment of them all can in due time be effected upon the following basis:

First. By changing the northern and western boundaries of the park, as recommended in the boundary section, so as to conform to those of Wyoming Territory, thus at once severing an unnecessary 3-mile strip upon the west, and also the 2½-mile strip of mining region upon the north, and leaving the park clear of an antagonistic mining population, questions of jurisdiction, and its two most important boundaries run, well marked, known, and recognized by all parties, without cost to the park.

Second. By honorable treaty with the Crows, obtain a recession of the old Sheepeater mining portion of the Great Bend of the Yellowstone above the Gate of the Mountains, by satisfactory remuneration if necessary; for though, as above shown, not theirs originally, or ever by possession, yet it surely is by honorable treaty, and although less liable to lead to hostilities than where the parties oftener meet along the river, still unrestrained license, even under seeming palliating circumstances, upon one portion of the reservation invites trespass elsewhere, and with the sensitiveness of the Crows from wanton encroachments along the river below, may, from a spark in the mines, kindle a flame only quenched in innocent blood. Hence, for an honorable adjustment of these various conflicting claims of priority of title and of jurisdiction in behalf of private rights and national development, and in the interest of humanity towards the Crows, who, despite isolated individual acts of violence for plunder or revenge, have as a tribe ever been our true friends; for the safety of the industrious pioneers upon the border and their innocent families, who are usually the victims in Indian wars; for the security of government agents and property, as well as of tourists within the park, I feel the necessity of urging the above or other mode of adjustment, and also prudence, forbearance, and conciliation by all parties interested, pending negotiations for its consummation.

ANCIENT AND RECENT MAMMOTH SPRING TERRACES.

Some early scientific visitors of these regions believed that the matchless terraces at the Mammoth Hot Springs were formed by limestone precipitated in the still waters of an ancient lake, and there horizontally stratified. But this theory was soon supplanted by the evidently correct

one, that they are wholly formed by deposits from hot-spring waters issuing from the funnels of long, tortuous escape-vents of a huge, deep-seated fissure in the carboniferous limestone, and thence along its line of contact with the more recent cretaceous, tertiary, and lava deposits, to where their elevated edges are eroded by the forces which carved the yawning cañon of the Gardiner River, as well as those of its three branches, and the eroded park-like valley at their confluence. As this newly-centered and all-powerful internal pressure was mainly through carboniferous limestone, the dissolving of the walls and enlargement of water-clogged vents or orifices, and consequent building up of cavernous terraces, resulted in not only filling up the cañon gorge of the West Gardiner, but actually building a mountain barrier two miles broad, connecting Sepulchre Mountain with Bunsen's Peak, forming an elevated lake, the main outlet of which was for a time around the latter into the Middle Gardiner at the Sheepeater Cliffs. From the plateau summit of this Terrace Mountain the lime-charged hot waters, at the period of their greatest power, descended in pulsating throbs over its rapidly-forming, beautifully-white, calcareous, scollop-bordered bathing-pools, with terraced slopes nearly 1,000 feet to the mountain lake above, and fully 3,000 feet to the cañon of the main Gardiner River below. Along or near the latter are the various McGuirk Springs, certainly the largest in that vicinity, but their waters are not lime-charged and terrace-building, but medicinal—deemed valuable for rheumatism and similar diseases—although a portion of them are perhaps somewhat connected with the sinks of the terrace springs above. But to this accepted, and doubtless mainly correct, theory of the waning power and continuous downward march of the focus of the modern terrace-building springs, there is abundant evidence of secondary or independent agencies at some remote period, heretofore unrecorded, if indeed thoughtfully observed by scientists, to which I invite their candid investigation. For fully one mile along the main Gardiner River, near the McGuirk Springs, always one and often both of its banks are bold terraces or eroded cavernous cliffs of ancient hot-spring deposites, clearly revealing their laminated structure and central orifices or cones, and overlooked by the now pine and cedar fringed lower terraces, aggregating nearly one thousand feet in elevation. The southern portion of these are now shattered or eroded into galleried halls, hidden grottoes, or tottering columns, and balustrades, unique, unrivalled, and incomparable save to the crumbling ruins of an ancient temple.

At a more recent period the geyserite plateau from the head of these lower terraces was a huge pool or shallow lake of foaming hot water, dotted with fumaroles, salses, and pulsating geyser cones like the Devil's Thumb or Liberty Cap. The base of the latter and nearly all of the former, and an unknown portion of the upper end of this plateau, are now covered by the descending upper terraces, through many portions of which the not decaying but semi-petrified steam and storm abraided tops and trunks of pine or cedar forests still protrude. The still visible portion of the geyserite plateau, for fully a mile in length and one-fourth of a mile wide, sounds hollow and cavernous to the tread of men or animals, and is dotted with yawning, often dwarf-timber fringed sink-holes, or crumbling basins of extinct geysers and other hot springs, of all dimensions to one hundred or more feet in diameter and fully half as deep, after exhibiting beautiful stalactite formations. In one of these conical sinks a huge antlered elk sought a covert, probably during a drifting snow-storm during the past winter, and by the sudden settling of the snow-pack became entrapped by its overhanging walls and

perished from the effects of poisonous gases or starvation, and only by the use of ropes were the finest pair of horns which I ever saw obtained. But, unlike all other known extinct geyser or other hot-spring formations, this plateau and the upper portion of its lower terrace borders bear no evidence of waning power or dwindling supply of water or of deposits, and comparatively little of age, crumbling, or erosion, all seeming as though the powerful operating forces or agencies had been brought to a sudden and permanent suspension.

Believing that for effects so evident, so anomalous, and geologically recent, the cause was neither remote or unfathomable, I have for years been upon the alert for a clue, and perhaps obtained it. The once seething, now pine, fir, and cedar fringed plateau summit of the Terrace Mountain affords from its near 9,000 feet of elevation a view of not only one of the most beautiful and romantic of earthly landscapes, but also matchless opportunity for tracing the evidences of the successive operations of molten lava, seething, calcareous, hot, and escaping torrents of cold water and the eroding outline-rounding effects of the frosts and storms of a sub-alpine climate. The terraced slope of at least the upper half of the lower or northern and eastern sides of this mountain are now covered with a dense growth of small but beautiful cedar, pine, balsam, and red fir timber, the upturning of which uniformly reveals ancient terraces and bathing pools with scallop borders, in form and coloring as beautiful, and from being purer limestone harder, and often sharper cut outlines than those now forming thousands of feet below them, and thousands of years more recent. The western and equally steep slope shows upon its grassy surface not only the abrading effects of the prevailing storms, but also, upon at least its lower portion as well as upon that of Bunsen's Peak, unmistakable traces of ancient shore lines of the mountain lake. To the south is the yawning cañon of the West Gardiner, torn along the line of contact of Bunsen's Peak and Terrace Mountain by the escaping waters of this mountain lake, which by undermining precipitated enormous land-slides from each. A search for animals upon hundreds of acres of our eroded valley pasturage below this cañon gorge will require sufficient climbing over and among the rocky debris of these enormous mountain slides to convince the most superficial observer of their reality and the clear-cut sky-line of the white cliffs, so noted a landmark for many miles, even from the mountains beyond the Yellowstone, are only the nearly 1,000 feet vertical face of the marbleized calcareous hot-spring formations of the Terrace Mountain still remaining. That while this Terrace Mountain was the only barrier between the mighty pressure and lashing waves of the mountain lake, a portion of its waters at an elevation of some 3,000 feet above McGuirk's Springs, less than four miles distant, should, after the focus of internal pressure had in its waning power descended below that of the lake, percolate either through its calcareous formations or along the unconformable line of contact of this Terrace Mountain, with one or both of those abutting it, seems very probable. If this be true we have a ready solution of the question as to the cause of the enormous deposits along Gardiner River, the Geyserite Plateau, Liberty Cap, and other geyser-cones, fumaroles and salses, and in cutting off the supply of water by drainage of the mountain lake, the evident cause of the sudden and final suspension of activity in all of the springs thus supplied. Additional support of this theory is found in the boggy lakelets of the West Gardiner Valley, above this cañon, and notably along our road near the Terrace Pass. This portion of it discharges, not to the West Gardiner, but from very near it in the open val-

ley, still drains into a marshy pond or shallow lakelet so hidden in a notch of Terrace Mountain that upon my first exploration of it, when returning from the Fire Hole regions (1875), I was greatly surprised to find a smooth, dry, elevated pass along the line of contact with Sepulchre Mountain instead of a ragged cañon waterway, as at the other flank of the Terrace Mountain. That this pond is the reservoir for a small quantity of water still percolating beneath this pass seems probable, and that the volume of water in the now active terraces, and at least the upper McGuirk Springs, varies with the seasons and supply is too evident to doubt; but the connection or sympathy of the supply of water above and its discharge below the mountain, although probable, is not fully established by continuous observation and record. Should it become so, important results may soon follow. As from personal observation I believe the West Gardiner can be easily and cheaply turned from its cañon out of the side of Sepulchre Mountain into the little lake so as to render it a permanent supply reservoir, it becomes a problem of great scientific interest and practical importance to learn, if possible, whether the supply of internal heat and power be still ample and the subterranean connection sufficient to increase the power actively and consequent amount of deposits in any or all of these hot spring terraces and pulsating geyser cones, and renewal of their ancient beauty; or, perchance, only to enlarge the subterranean channel to the great spring on the Gardiner River, and thus hasten the descent and perhaps extinction of the still active terrace springs. Deeming the responsibility of thus forming a mountain reservoir too great to assume without further observation, consultation with practical scientists, and, perhaps, careful experiments, the subject is dismissed with the earnest hope that these candid statements and suggestions may lead to thorough scientific research and beneficial results.

OBSIDIAN MOUNTAIN.

I this year traced the mountain of obsidian or volcanic glass from where I discovered it last year, at Beaver Lake, to a branch of the Gibbon, below the Lake of the Woods, a distance of some eight miles, proving that it is there the true divide of the waters of the Missouri and the Yellowstone, and also a vast weapon and implement quarry for the ancient hermit Sheepeaters.

GEYSERS AND OTHER HOT SPRINGS.

The new crater which burst forth in the Norris Geyser Plateau, with such upturning and hurling of rocks and trees, August 11, 1878, and was for the remainder of last year a high crater of hissing gas, steam, and mud, seems this year to have settled down to business as a very powerful flowing geyser, having, in common with many others, a double period of eruption, one some 30 feet high about each half hour, and another of nearly 100 feet and long continued, each six or seven days, and is doubtless still changing. Countless hot springs and some important geysers were this season discovered on this plateau and its mountain rim, and enough red pulsating geysers in its upper cañon of the Gibbon to justify a tourists' trail through it. In fact, this geyser region seems to occupy some 20 or 30 square miles, being not only the largest and most elevated, but probably oldest and once most important, of any within the park. It is apparently also the hottest, not only from the thermometer readings, but its effects upon persons crossing them; and while the other

basins were, in November, enveloped in chilling, suffocating fogs, with more than two feet of snow upon Mount Schurz, between them this, though shrouded in steam and mist, was wholly clear of snow, grass luxuriant, and the streams and ponds, not too hot, alive with ducks, geese, swan, pelican, and other water-fowl. The second largest of the great midway springs, which last season, unwitnessed, certainly exhibited the greatest geyser-eruption of which we have any evidence, was, this season, as previously, not only a seething lakelet with a huge outlet of hot water, but its denuded margin and remote border of water-hurled rocks unmistakably proves it the prince of geysers when semi-occasionally aroused. I have neither personal or other satisfactory evidence that the Giant or Giantess exhibited a full old-time eruption during the past season, and though such may have occured, and for a time may continue at long, uncertain intervals, still I incline strongly to the opinion that they, as well as the Lion and others, have passed the period of their greatest power, and will be slowly, but surely, supplanted by others. Old Faithful, though still the favorite geyser, has certainly lost prestige by an occasional prolongation of its intervals between eruptions of from five to fifteen or twenty minutes during the extreme dry weather of the past season; but whether it is temporary for want of water, or permanent from change of supply fissures or other cause unknown, time alone will determine.

The route from Old Faithful to the Yellowstone Lake will render accessible the hot springs upon the latter and upon the Upper Fire Hole River, above the cascades, and, with a short line of bridle path, those of the Shoshone, Lewis, and Heart Lakes; while the Pelican Creek route connects its sulphur basin and those of Turbid Lake with those of the famous medicinal springs upon the Soda Butte.

PLACID WARM STREAMS.

Few of the anomalous features of this *land of wonders* are of greater scientific interest or of more practical value than the placid, uniform water-flow in its hot spring and geyser-fed rivulets and streams. While the Black Tail, Tower Creek, various branches of the Gardiner, and other cold snow-fed streams, are, as in other mountain regions, bold, dashing torrents, subject to terrible ice gorges and overflows; the main Gibbon and its geyser-fed branches, all the Fire Hole Rivers and the Madison from its head, at their confluence, to where its waters chill below the upper cañon, are alike dotted with grassy meadows in their channels, covered with floating bubbles and clear of ice gorges and floods. True, an able and esteemed scientist, in his exploration of these regions, queried if the peculiar appearance of timber in some of the Fire Hole valleys was not evidence of occasional severe floods; but careful and continuous observation leads me to the conclusion that the penetrating, semi-petrifying effect of local overflows, or capillary infiltration of timber, from many of the hot mineral springs is, and has ever been, so great that even standing timber may long outlast the eruptions and even accompanying springs. But I fail to find evidence of recent widespread overflows, by either hot or cold water, of the main streams in any of the hot-spring valleys. Although these mineral waters are all in elevated snowy regions, mingled with the cold mountain torrents, and are really rapid streams with an occasional cascade or cataract, yet an observant tourist will at once note their broad, shallow, grassy channels, uniformly smooth banks, with a dense growth of short grass and flowers, carpeted to the water's brim, and total absence of bayous, mud-banks, driftwood, or other evidence of overflowing waters. Thus the

stretches of long flowing grass and occasional hot-spring pools in the channels and the actually overhanging turfy banks are usually the main obstacles in crossing these streams; and hence the cutting of a sloping way through the turf usually forms an excellent and permanent ford, thus greatly reducing the necessity for bridges. In fact, long limber poles and foot-logs, only a few inches above the low stage of water in several of these streams along our road to the geysers have thus safely remained during two seasons, and even poles, levers, and hand-spikes by us left last year at the very water's brink are still there undisturbed. Even the Gibbon, in its great cañon, through a snowy range and uniformly very rapid, averaging at least 100 feet wide and knee deep, with two cascades, has the ever interesting feature of countless, huge, often pine and cedar clad mountain bowlders, so eroded at the base by this impetuous, changeless volume of warm mineral water as to appear like inverted sugar loaves or huge fossil eggs, erect upon their smaller ends, tottering, and ultimately overturning into the stream to renew the process—peculiarities never observed elsewhere, and in fact impossible in the ever changing surface of cold-water streams.

FOSSIL FORESTS.

The explorations of each successive year greatly add to our knowledge of the known area, the magnitude and the marvels of the fossil forests of the Amethyst Mountain, East Fork, and Soda Butte regions. There the slow but ceaseless erosion of the frosts and storms of an Alpine clime expose bas-relief views of gigantic trees standing—except the front roots and branches—just as they grew, or lying as crushed and buried in the now towering cliffs of basaltic lava, and the storm-strewn fragments of primeval forests containing opal, onyx, or chalcedony caskets of brilliant amethyst and other crystals, unique and priceless, eagerly sought and carefully preserved in the cabinets and the museums of every civilized land.

NOTABLE RELATIVE POSITION OF VARIOUS HOT SPRING REGIONS.

I have never heard a word or read a sentence upon the subject, but my constantly increasing knowledge of the geyser and other hot spring regions renders more evident the notable relative location of the various basins, terraces, and plateaus. Careful observance of any good map of these regions will show:

1st. That the interesting Geyser Basin at the southwestern extremity of Shoshone Lake, the Lone Basin, 5 miles above Old Faithful, and the Upper, Midway, and Lower Basins upon the Fire Hole rivers, the Gibbon Basin and Norris Plateau upon the Gibbon, the Obsidian Cañon and Mammoth Hot Springs upon the Gardiner, and the immense deposits of nearly extinct hot springs at its confluence with the Yellowstone and along Bear Gulch, comprising far the largest, most interesting, and important chain of thermal springs in the park, or the world, trend for a distance of fully 60 miles, in one of the roughest of earthly regions, in scarcely a perceptible variation from an air line.

2d. That said line is one of longitude, or nearly due north and south.

3d. That the hot springs in the lower two cañons of the Yellowstone, and at Emigrant Gulch between them, Hunter's and other hot springs along or near Shields River, and the famous White Sulphur hot springs on the Mussel Shell, are nearly a direct extension of said line some 150 miles northward.

4th. The numerous active and extinct hot springs along Snake River

and Jackson's Lake, near the Three Tetons, are an extension of the same line 50 miles south of it, making fully 250 miles of mostly continuous and direct line of geysers or other hot springs, with the Oneida salt and the famous soda springs on the old Emigrant road, near Bear River, 100 miles farther, with only a slight deflection southwesterly, passing in all through portions of Montana, Wyoming, Idaho, and near the borders of Utah.

5th. The outlying hot spring regions do not usually diverge, as roots or branches, from the main line, but uniformly in nearly parallel lines therewith and with each other, as those of the Yellowstone, Cañon Falls and Lake, including the Sulphur Mountain, Mud Volcano, and Heart Lake; another forms the Soda Butte, Pelican Creek, Turbid Lake, and Steamboat Point line of hot springs and sulphur basins.

I cannot doubt that a brief examination of maps and candid pondering over these coincidences will, with most thoughtful men, develop the conviction that these were not the effects of mere chance, but the result of some deep-seated cause or influences. But I am not advancing theories, only recording facts deemed well worthy of able scientific investigation. Although there is now no unexplored portion of the park large enough to hope for the discovery or probability of the formation of other extensive geyser basins, still each individual spring and geyser is slowly but surely changing, and countless numbers will yet be found and formed, to long encourage the explorer, and none can foresee a period of time when geyser eruptions will cease, the desire of thoughtful men to view them wane, or the study of their causes and character fail to be of absorbing interest to the scientists of every land.

ROADS AND BRIDLE PATHS.

This season's explorations clearly show an excellent trail and fair wagon-route from the foot of Yellowstone Lake via the east fork of Pelican Creek to the Stinkingwater Pass, towards the Big Horn Valley, doubtless destined to become a summer route of access to the park from all those regions, as soon as occupied by white men, and ultimately for the most of Wyoming Territory, in which the park is mainly situated. Much of interest was this year learned of the region toward the Two Ocean Pass and Wind River Valley; but nothing to justify present expenditures upon a route mostly through impenetrable forests or snowy passes, totally uninhabited and mainly without the park. The Pelican Creek route, from the Soda Butte to the foot of Yellowstone Lake, although passable for a trail, and possessing much interest as traversing the fossil forests and sulphur basins, is still too elevated to anticipate a road in the near future.

Few trails or roads anywhere, for its length and cost, will possess the present or future interest of that past the Great Cañon and falls of the Middle Gardiner River.

Careful and continuous observations from all the surrounding landmarks confirms my conviction that the route which I explored late last year, overlooking the Grand Cañon of the Yellowstone through the eastern spurs of Mount Washburn, instead of over it, near the summit, as at present, is the true one, for either bridle-path or wagon-road, and only untimely snows prevented the completion of a trail there the past season.

It has not been deemed advisable to attempt to open the Great Cut-off Pass, which I explored in 1877, from the east fork to the main Yellowstone, via the Stillwater, until there are fewer Indians and more white men along it.

BOUNDARIES OF THE PARK.

The earnestness with which I have constantly urged the survey of the boundary line between the Territories of Wyoming and Montana is fully justified by its results. As anticipated, it has greatly assisted in restraining lawlessness within and adjacent to the park, and in checking the influx of ranchmen upon the southeastern border of the Crow Indian Reservation and determining the true location of the mining camps across the Yellowstone, from the main portion of the park where the Crow Indians seldom go, never remain long, or molest white men. This boundary survey of Mr. R. J. Reeves also clearly shows, that while the mines and smelting works at the head of Clark's Fork and Soda Butte are within the park (unless east of it), all of them, as well as those of Crevice and Bear Gulches, are wholly in Montana. In fact, it is as anomalous as fortunate that while Montana embraces all the mines of gold, silver, lead, and copper yet prospected or likely to ever be found within the park, so near the territorial boundary is that between the metamorphic mineral-bearing rocks and the igneous or lava and hot spring formations, that Wyoming embraces every geyser or other hot spring, hot spring terrace, cone, or cavern, obsidian mountain, fossil forests, or other wonders or objects of interest for which the park was dedicated, and is or ever will be desirable. With the proverbial uncertainty of mining camps, those which now appear moderately promising may not prove permanently successful; but beyond question there is sufficient mineral of various kinds to encourage continuous prospecting, and a mining population with tastes, habits, and organizations so directly antagonistic to the necessarily peculiar laws, rules, regulations, and management of a national health and pleasure resort, that complications alike unpleasant, unprofitable, and unsafe for all parties will be unavoidable and constant; while the unnatural and unnecessary appendage of a less than 3-mile strip of Montana Territory remains attached to the park, otherwise situate wholly within the Territory of Wyoming. Hence, as in my previous reports, and the conflicting boundary section of this, I again urge the now more evident and urgent necessity of changing the northern and western boundaries of the park so as to conform to those of Wyoming; my thorough explorations clearly showing that there are no wonders adjacent to it upon the west, and hence (as above stated) that it embraces all which is desirable to retain within the park. This would also give us the two most important lines already established, marked, well known, and recognized by all parties, without cost to the park, and by placing it wholly within one Territory simplify its present and future management.

Two brief sections comprising the act dedicating the Yellowstone National Park contain (save two appropriations of $10,000 each for its protection and improvement) all the legislation to be found regarding it. (See Revised Statutes of the United States, p. 453.)

That it was a wise and timely act, conferring enviable fame upon the scientists who planned, the Congress which passed, and the President who ratified it, enduring benefit to the people, and glory to the nation owning this peerless heritage of wonders, few intelligent men of our own or of other lands will now question. But, like other hasty acts of legislation in an emergency, time and experience have revealed its omissions and its defects, rendering evident the necessity for slight changes in the boundaries of a then mainly unexplored region, and also additional legislation to render plain and practical the requisite discretionary powers of the honorable Secretary of the Interior and his superintendent in en-

forcing their necessarily anomalous laws, rules, and regulations for the proper management of the largest, most interesting, and important, doubtless soon the most popular, health and pleasure resort upon our globe.

During the past season Mr. N. W. Comfort and wife safely drove a team with trail wagon and 400 head of cattle from Oregon via Henry's Lake and our road through the park to the Lower Yellowstone Valley, and we had the use of two milch cows at the Mammoth Hot Springs of J. Beatie for the summer pasturage of his herd of some 300 cattle upon the Black Tail.

Vandalism of the inimitable geyser and hot spring formations is greatly checked, and with an active, faithful assistant at our house in the Upper Geyser Basin during the greatest influx of tourists each season and the desired laws and local assistance will, I trust, leave little future cause of complaint.

PROTECTION OF ANIMALS.

So with indigenous animals. I have not allowed the killing of bison, and so checked the wanton slaughter of elk, deer, sheep, and antelope, mainly for their pelts and tongues, by the mountaineers, that, although grown shy of the usually harmless fusilade of tourists along the main routes of travel, I have, save near the Mammoth Hot Springs, seldom failed to find in secluded parks near our roads abundance of game for our largest parties. But as the flesh, if not dragged down and devoured by bear, wolverine, or mountain lion, will keep perfectly, hung up unsalted in the forest, for at least two weeks at any season of the year, there is little wasted, and I am confident these choice animals have increased, rather than diminished, in numbers within the park since my management thereof. But with the rapid influx of tourists and demand for such food this cannot long continue, and hence the more evident and pressing necessity for systematic and permanent protection of all, and domestication of some of the most rare and valuable of animals in the eastern portion of the park by the assistance of the lessees of hotel and ranch sites, as so clearly stated and strongly urged on pages 11, 12, and 13 of my report of 1877, and again on page 10 of that of 1878. In this connection it is gratifying to find that the intelligent members of the legislature of Montana, at its last regular session, enacted the following law:

AN ACT to protect bison in certain counties in Montana Territory.

Be it enacted by the legislative assembly of the Territory of Montana:

SECTION 1. That any person who shall willfully shoot, or otherwise kill, for the period of ten years from and after the passage of this act, any buffalo or bison, within the counties of Madison, Jefferson, Deer Lodge, and Lewis and Clarke, Montana Territory, shall be fined not less than one hundred dollars nor more than two hundred dollars, or imprisoned in the county jail not less two months and not more than six months, or both such fine and imprisonment, at the discretion of the court.

SEC. 2. That the possession of the green hides, or the dead bodies, or any part thereof, of any buffalo or bison, by any person, or persons, within the limits of said counties, shall be taken as *prima facie* evidence that such person, or persons, are guilty of killing the same.

SEC. 3. Any person informing on any person violating the provisions of section one of this act shall, upon the conviction of such person, be entitled to one-fourth of the fine collected.

SEC. 4. It is hereby made the duty of the judges of the district courts held in the respective counties of Deer Lodge, Jefferson, and Lewis and Clarke to give in charge to the grand juries of said counties the provisions of this act.

SEC. 5. This act shall take effect and be in force from and after its approval.

Approved February 21, 1879.

If the sagacious leading gentlemen of that thriving Territory deem it necessary and feasible to thus supplement ordinary stringent game laws to preserve a remnant of the buffalo and bison that so recently grazed in countless millions upon the nutritious pasturage of their plains and valleys, should not we make systematic efforts for their protection in the park? If these legislators rely upon such enactments and enlightened public sentiment to save from extermination the remnant of these animals scattered through their elevated mining camps, surely the strong arm of the government, through the honorable Secretary of the Interior and his superintendent and assistants in the park, backed by the lessees of hotel sites, sustained by the united influence of the leading thoughtful men of our own nation and sympathy of the scientists of other lands, should in the native haunts of the remote lake, cliff and cañon girt fossil forest portion of the people's health and pleasure park, the nation's peerless wonder-land, by protection of all and domestication of a portion, perpetuate specimens of these and our other most beautiful, interesting, and valuable indigenous animals when elsewhere found only in the natural histories of extinct species.

SUMMARY.

From the foregoing statement of the season's operations, it is evident that by making an early start the park was reached by the slow circuitous route necessarily taken, a strong party organized, and improvements commenced in good season.

That the month of June was the stormiest ever known in those regions, all of July, August, and early September continuously beautiful, and so dry as to allow extensive forest fires in all those mountain regions; but owing to the ceaseless vigilance of our men in seeing to their camp-fires as well as those of tourists, less damage was done within the park than around it, or than has there heretofore occurred. During the otherwise beautiful autumn were several severe storms of snow, which during October became too deep in the elevated passes for profitable prosecution of improvements, which were, however, continued in the valleys, as far as the limited appropriation of funds at my command would justify, until late in November, and still continued in favorable weather by the three men left well housed, provisioned, and equipped for winter in our block-house at the Mammoth Hot Springs.

The excessive rains of June were utilized in grading the thus softened mountain spurs down the Gardiner, and the continuous fine weather following improved by continuous prosecution of explorations and improvements with most gratifying results.

TOURISTS.

Tourists, including many ladies and children, from various portions of Montana and Idaho, traveled our roads and bridle-paths with their own carriages and wagons or saddle and pack animals. Also, mainly with guides, pack-train, and escort, Generals Sackett and Hazen, Major Brisbin, and many other military gentlemen from our own Army and those of Europe; Messrs. Thompson and Cadwalader, of Pennsylvania; Buckland, of Ohio, and other prominent railroad officials; Professor Geikie, of Scotland, and other noted scientists; Capt. W. S. Johnston and J. J. Broom, of New York; Hobson and Zeigler, of Iowa, and other prominent gentlemen and ladies from various regions, aggregating at least 1,000 persons, safely visited and returned from the park during the past season.

The unanimous opinion of all of those I saw or have learned their views was, they were richly rewarded in novelty, enjoyment, scientific knowledge, and health for their hardships, privations and expenses, and many of them pledged to return with friends upon completion of shorter, cheaper, and more convenient routes of access to the wonderland. These are now rapidly approaching, not only by the extension of the Northern Pacific Railroad westward towards the Yellowstone River and steamboats in ascending it, but more notably by the extension of the Utah Northern Railroad from Ogden, nearly 300 miles, through portions of Utah and Idaho, via Pleasant Valley Pass of the Rocky Mountains, into Montana.

From the nearest approach of this road at Camas Creek, in the Great Snake River lava plain, there is a good, well-traveled road for 60 miles, via Shotgun Pass and Henry's Fork, to its lake, at the head of which the small military summer's camp last season proved, as I have long urged, a perfect protection to the park from Indian raids through this matchless gateway of the mountains. Thence it is some 20 miles of fair road—the five good fords of the Madison in its upper cañon being the main obstacles—to the junction of our roads within the park. It is only 15 miles thence to the Upper Geyser Basin, and present terminus of the road in that direction; but by following the trail this year opened, and which I deem vitally important to complete as a road next year, it is some 100 miles additional, via Shoshone and Yellowstone Lakes, Mud Volcano, Sulphur Mountain, Great Falls, head of Grand Cañon, Mary's Lake, and Lower Geyser Basin, to the junction, and 45 miles additional along our road to the Mammoth Hot Springs. Tourists may thus, in a coach trip of some 250 miles from the railroad, reach and make a circuit of the leading wonders of the park and easily view the remaining objects of interest by short branching roads or bridle-paths. Tourists can then have a choice of returning direct by the junction and Henry's Lake to Camas, or by coach 76 miles to Fort Ellis and Bozeman, and some 200 miles additional coaching to steamboats upon the Yellowstone.

It is also very desirable, for purposes within and without the park, that a road be constructed without delay through the cañon of the East Gardiner and the forks of the Black Tail to that of the Yellowstone, and a heavy and expensive bridge over the main stream, as the old rotten and dangerous Barronette foot-bridge, without approaches for wagons, is the only way for reaching the East Fork, Amethyst Mountain, and Soda Butte portions of the park, or the smelting-works and mining-camps of Soda Butte and Clark's Fork. A road connecting this route via Tower Falls, Grand Cañon, and Great Falls of the Yellowstone, with the Mary's Lake route at Sulphur Mountain is very desirable, but too rough and expensive to hope for more than a bridle-path in the immediate future. With an appropriation sufficient to complete these improvements within the park next season, not only are these railroad and steamboat facilities assured by a line of coaches through the park, connecting them, but also propositions from able and desirable parties for leasing sites and speedy construction of commodious hotels, bath-houses, and other conveniences at the Mammoth Hot Springs, Geyser Basins, and other points of greatest interest.

There are now pending propositions for a hotel site at the Mammoth Hot Springs, foot of Yellowstone Lake, and for a steamboat upon the lake, and also a hotel and bathing-houses at the Cold Soda Butte Medicinal Springs, traditionally famous for marvellous cures of jaded and saddle-galled horses and sick or wounded Indians, and now little less noted among the roving mountaineers as second only to the Arkansas Springs

as a specific for the same diseases. As the lessee of at least the Soda Butte site should also be a keeper of the wild and the domesticated animals indigenous to the park, and several if not all of the other lessee government agents within certain prescribed districts, to check vandalism and assist the superintendent in enforcement of necessary laws and regulations for the proper management of the park, great care and deliberation are requisite to secure parties of known responsibility, integrity, and other qualifications to thus assist in retaining intact the natural scenery, animals, and wonders of the park, properly construct and conduct hotels for the accommodation of tourists, and keeping the property insured against fire, to ultimately revert to the government for releasing. This assures immediate coach connection with civilization, convenience for tourists, and ultimate self sustaining character of the park, in a shorter time and at less expense than ever promised, or even anticipated, by the most enthusiastic friends of the peerless wonder-land.

P. W. NORRIS,
Superintendent of the Yellowstone National Park.

Hon. CARL SCHURZ,
Secretary of the Interior, Washington, D. C.

APPENDIX.

Weather record kept in the Yellowstone National Park during the season of 1879, *mainly at the Mammoth Hot Springs. Latitude,* 44° 59′ *north; longitude,* 110° 42′ *west; elevation,* 6,450 *feet.*

Location.	Date.	Sunrise.	Noon.	Sunset.	Remarks.
	1879.				
Mammoth Hot Springs	June 12	.....	63	54	Rain and sleet storm.
	June 13	50	64	58	Cloudy.
	June 14	52	65	57	Cloudy, and sleet squalls; NW.
	June 15	48	60	55	Cloudy.
	June 16	44	55	50	Fair, but gusts of wind SW.
	June 17	48	60	55	Fair.
	June 18	50	62	58	Rainy.
	June 19	51	65	60	Heavy winds.
	June 20	53	67	53	Clear.
	June 21	53	72	67	Showery from the NW.
	June 22	42	74	60	Clear.
	June 23	48	75	46	Showery from NW.
	June 24	44	62	50	Do.
	June 25	45	65	50	Do.
	June 26	48	68	50	Heavy rain-storm, NE.
	June 27	36	74	50	Clear.
	June 28	40	78	60	Do.
	June 29	60	80	61	Showery; SW.
	June 30	50	54	50	Rainy day; NW.
Average of the 18 days taken in June.	.....	43	70	57	Fair days, 6; prevailing wind NW.
Mean	.....		57		
Mammoth Hot Springs	July 1	32	60	60	Clear; ice in a. m.
	July 2	45	58	50	Clear.
	July 3	48	70	48	Do.
	July 4	62	78	50	Clear; wind SW.
	July 5	62	80	54	Clear.
	July 6	48	74	60	Do.
	July 7	60	82	60	Do.
	July 8	60	84	70	Do.
	July 9	60	80	75	Do.
	July 10	60	80	61	Clear; wind SW.
	July 11	61	78	58	Clear.
	July 12	60	81	65	Cloudy; wind SW.
	July 13	62	80	65	Cloudy.
	July 14	59	80	61	Do.
	July 15	58	84	59	Fair.
	July 16	60	82	60	Showery; thunder; wind SW.

Weather record kept in the Yellowstone National Park, &c.—Continued.

Location.	Date.	Sunrise.	Noon.	Sunset.	Remarks.
	1879.				
Mammoth Hot Springs	July 17	61	82	65	Clear.
	July 18	58	80	60	Do.
	July 19	60	75	70	Do.
	July 20	61	81	60	Do.
	July 21	60	86	70	Clear; wind S.
	July 22	60	84	70	Clear.
	July 23	60	68	60	Showery: NW.; mercury fell 14° in one hour.
	July 24	56	68	60	Clear.
	July 25	54	70	60	Do.
	July 26	54	70	61	Do.
	July 27	55	71	60	Fair.
	July 28	54	86	70	Cloudy; wind SW.
	July 29	58	88	72	Clear; wind SW.
	July 30	57	82	70	Clear.
	July 31	56	87	73	Do.
Average of the month		59	80	63	Fair days, 23; prevailing wind SW.
Mean			67		
Mammoth Hot Springs	Aug. 1	45	73	68	Clear.
	Aug. 2	46	78	68	Do.
	Aug. 3	50	82	70	Do.
	Aug. 4	52	78	65	Do.
	Aug. 5	50	75	62	Cloudy.
	Aug. 6	47	74	65	Cloudy; showers.
	Aug. 7	42	75	68	Showers.
	Aug. 8	45	79	67	Clear.
	Aug. 9	50	82	69	Do.
	Aug. 10	55	86	70	Do.
	Aug. 11	48	84	70	Do.
	Aug. 12	45	66	60	Rain; NW.
	Aug. 13	45	72	65	Clear.
	Aug. 14	50	80	70	Clear; SW.
	Aug. 15	45	76	70	Rain; SW. wind.
	Aug. 16	53	81	70	Rain.
	Aug. 17	53	72	66	Clear.
	Aug. 18	54	78	70	Rain.
	Aug. 19	50	75	70	
	Aug. 20	56	78	68	Clear.
	Aug. 21	53	74	61	Do.
	Aug. 22	54	73	60	Do.
	Aug. 23	55	72	61	Do.
	Aug. 24	52	70	62	
	Aug. 25	45	80	70	Clear.
	Aug. 26	58	82	74	Showery; SW. wind.
	Aug. 27	58	78	70	Showery.
	Aug. 28	52	62	70	Rain; NW.
	Aug. 29	42	50	48	Clear; NW.
	Aug. 30	38	60	50	Clear.
	Aug. 31	42	65	58	Do.
Average of August		49	74	69	Clear days, 24; prevailing wind SW.
Mean			64		
AUGUST—EN ROUTE TO THE GEYSERS.					
Terrace Pass	Aug. 1	45	70	60	Clear; wind SW.
Willow Park	Aug. 2	45	71	62	Do.
	Aug. 3	50	70	60	Do.
	Aug. 4	48	60	60	Showery; NW.
Obsidian Cañon	Aug. 5	50	70	61	Clear; SW.
	Aug. 6	56	70	56	Showers; SW.
Beaver Lake	Aug. 7	56	71	60	Clear; SW.
	Aug. 8	58	80	61	Do.
Lake of the Woods	Aug. 9	40	82	58	Do.
	Aug. 10	40	80	58	SW.
Norris Plateau	Aug. 11	32	80	55	Do.
Mount Norris	Aug. 12	30	80	60	Snow-squalls on mountain; NW.
	Aug. 13	32	81	62	Clear; SW.
Gibbon Cañon	Aug. 14	31	84	50	Do.
	Aug. 15	32	60	50	Fair; SW.
Mount Schurz	Aug. 16	40	61	51	Snow-squalls; NW.
Average of 16 days en route		43	73	54	Clear days, 11; snow, 2; wind SW.
Mean			57		

Weather record kept in the Yellowstone National Park, &c.—Continued.

Location.	Date.	Sunrise.	Noon.	Sunset.	Remarks.
	1879.				
Mammoth Hot Springs	Sept. 1	44	70	55	Clear.
	Sept. 2	45	71	57	Do.
	Sept. 3	48	72	58	Do.
	Sept. 4	43	68	68	Shower; NW. wind.
	Sept. 5	45	64	50	Clear; SW. wind.
	Sept. 6	44	45	70	Snow-squall; NW.
	Sept. 7	42	76	70	Clear; SW.
	Sept. 8	44	78	75	Rain.
	Sept. 9	60	50	50	Snow; frost at night; NW.
	Sept. 10	40	50	45	Frost at night; NW.
	Sept. 11	25	50	50	Severe frost; NW.
	Sept. 12	30	50	50	Do.
	Sept. 13	30	55	45	Severe snow; NW.
	Sept. 14	25	60	50	Clear.
	Sept. 15	40	50	45	Clear; SW.
	Sept. 16	40	70	51	Clear.
	Sept. 17	35	72	50	Do.
	Sept. 18	40	74	42	Do.
	Sept. 19	40	70	51	Do.
	Sept. 20	41	72	52	
	Sept. 21	40	71	60	Not kept.
	Sept. 22	39	69	58	
	Sept. 23	35	70	61	
	Sept. 24	32	60	61	
	Sept. 25	40	60	61	
	Sept. 26	39	61	60	
	Sept. 27	40	61	59	
	Sept. 28	40	60	40	
	Sept. 29	35	40	41	
	Sept. 30	32	45	40	
Average of September		39	60	53	Clear days, 15; prevailing wind SW.
Mean			51		
Mammoth Hot Springs	Oct. 1	32	50	40	Clear; NW. wind.
	Oct. 2	30	50	45	Clear.
	Oct. 3	30	50	50	Snow-squalls.
	Oct. 4	40	50	45	Do.
	Oct. 5	40	51	41	
	Oct. 6	35	45	35	
	Oct. 7	37	47	38	
	Oct. 8	37	48	37	Snow 2 feet deep.
	Oct. 9	40	49	39	
	Oct. 10	32	40	30	
	Oct. 11	33	50	31	Snow-squalls.
	Oct. 12	32	45	30	
	Oct. 13	34	47	30	
	Oct. 14	30	46	32	
	Oct. 15	31	45	30	
Willow Park	Oct. 16	34	47	31	
Norris Plateau	Oct. 17	30	55	30	
Gibbon Cañon	Oct. 18	32	70	30	
Geyser Basin	Oct. 19	30	50	31	
	Oct. 20	34	40	35	
East Fire Hole	Oct. 21	30	55	30	
	Oct. 22	28	50	31	
	Oct. 23	26	60	30	Severe snow-squalls.
Mud Volcano	Oct. 24	22	45	32	
Sulphur Mountain	Oct. 25	20	50	31	
	Oct. 26	25	60	29	
Cañon Creek	Oct. 27	28	65	30	Clear.
Obsidian Cañon	Oct. 28	33	68	34	Do.
Willow Park	Oct. 29	27	65	40	Do.
Mammoth Hot Springs	Oct. 30	32	60	41	Do.
	Oct. 31	32	61	41	
Average of the month		22	52	30	Prevailing wind W.: cloudy and snowy most of the month.
Mean			35		
Mammoth Hot Springs	Nov. 1	20	65	41	Clear; wind SW.
	Nov. 2	21	58	40	Clear; SE.
	Nov. 3	32	58	48	Do.
	Nov. 4	32	50	40	Clear; E. gale.
	Nov. 5	40	48	49	Snow; SE.
	Nov. 6	48	34	32	Do.

Weather record kept in the Yellowstone National Park, &c.—Continued.

Location.	Date.	Sunrise.	Noon.	Sunset.	Remarks.
	1879.				
Mammoth Hot Springs	Nov. 7	20	35	22	Clear; SE.
	Nov. 8	9	30	21	Snow; SE.
	Nov. 9	21	32	21	Clear; SE.
	Nov. 10	20	30	35	Snow-squalls and SE. gale.
	Nov. 11	30	38	21	Snow; SW. gale.
	Nov. 12	20	38	26	Snow; SW.
	Nov. 13	21	24	21	Snow-squalls; gale in p. m., SE.
	Nov. 14	21	33	28	Snow; gale SW.
	Nov. 15	21	28	26	Snow-squalls SE.
	Nov. 16	21	34	22	Clear; wind SW.
	Nov. 17	8	36	22	Clear; W.
	Nov. 18	20	34	40	Clear; wind SE.
	Nov. 19	20	50	40	Clear; SE.
	Nov. 20	21	54	41	Clear; wind SE.
	Nov. 21	22	58	40	Clear; SE.
	Nov. 22	24	64	40	Clear; wind SW.
	Nov. 23	26	48	41	Clear; W.
	Nov. 24	27	46	36	Clear; wind SE.
	Nov. 25	32	32	30	Snow; SW. gale.
	Nov. 26	12	28	6	Snow-squalls; SW. gale.
	Nov. 27	— ?	33	12	Do.
	Nov. 28	18	28	24	Do.
	Nov. 29	26	34	33	Do.
	Nov. 30	34	36	36	Snow-squalls; SE.
Average of the month		23	40	31	Clear days, 13; balance of month mainly gales; wind SE.
Mean			31		
Mammoth Hot Springs	Dec. 1	33	40	32	Direction of wind, E.
	Dec. 2	34	38	34	Snow; SE.
	Dec. 3	34	40	34	2 inches snow; SE. and NW.
	Dec. 4	18	46	24	1 inch snow; SE.
	Dec. 5	17	40	20	Do.
	Dec. 6	16	28	18	2 inches snow; ESE. gale.
	Dec. 7	19	34	22	3 inches snow; ESE. gale.
	Dec. 8	10	14	6	3 inches snow; NW. gale.
	Dec. 9	3	16	8	Clear; south.
	Dec. 10	6	38	8	Do.
	Dec. 11	8	12	10	4½ inches snow; SW. gale.
	Dec. 12	9	14	8	5½ inches snow; gale.
	Dec. 13	10	14	16	4 inches snow; NW. gale.
	Dec. 14	15	20	9	3 inches snow; NW.
	Dec. 15	8	16	12	Clear; NW. gale.
	Dec. 16	6	12	9	Clear; SE. gale.
	Dec. 17	0	8	6	1 inch snow; SE. gale.
	Dec. 18	4	12	9	Clear; SE.
	Dec. 19	6	10	9	SW. gale.
	Dec. 20	14	26	18	Clear; SW. gale.
	Dec. 21	16	25	14	Do.
	Dec. 22	18	24	16	12 inches snow; SE.
	Dec. 23	19	6	15	15 inches snow; SE. gale.
	Dec. 24	32	2	11	14 inches snow; SE.
	Dec. 25	18	0	0	Cloudy; SW.
	Dec. 26	12	30	20	SE. gale.
Average of the month		12	18	12	66 inches snow; clear days, 6; prevailing wind SE.; gale, 14 days.
Mean			14		

The above records strengthen my previous impressions that the park is for its elevation less a severely cold than a moist and stormy portion of those mountain regions, save during a short but beautiful summer. But with the hoped-for instruments and assistance from the Signal Service, we may safely rely upon a greater knowledge and more satisfactory showing of the climate of the park in the next annual report.

ROUTES AND DISTANCES TO THE YELLOWSTONE NATIONAL PARK.

Assuming Chicago to be the general point of divergence for the great Northwest, routes and distances are properly estimated therefrom.

The main routes of access to the park are still the southern, or railroad, and the

northern, or river routes, both of which, as indicated in my report of last year, have been materially improved and shortened during the past season.

As no route within the park or any of its trail or wagon-road approaches have ever been measured, the distances, as given of them, are only careful estimates.

SOUTHERN ROUTE.

	Between points.	Total.
	Miles.	*Miles.*
Chicago via various railroad lines to Omaha	493	
Union Pacific Railroad to Ogden	1,031	1,524
Utah Northern Railroad to Camos	241	1,765
Wagon road and perhaps coach line during the season:		
Camos to—		
Shotgun Pass	20	
Henry's Fork	20	40
Livermore's Camp	10	50
Henry's Lake	15	65
Targhee's Pass of main divide	4	69
South Fork of the Madison	4	73
West line of the park	7	80
Cañon of the Madison to mouth of the Gibbon	8	88
Junction of road to Mammoth Hot Springs	5	93

NORTHERN ROUTE.

Chicago via various railroad lines to Saint Paul	409	
North Pacific Railroad to Bismarck	469	878
North Pacific Railroad to the terminus	125	1,003
Coach to Yellowstone River	125	1,128
Steamboat to mouth of Big Horn	130	1,258
Coach to Bozeman	205	1,463
Coach to Bottler's	40	1,507
Coach to north line of the park	30	1,537
Coach to Mammoth Hot Springs	6	1,573

ROUTES WHOLLY WITHIN THE PARK.

ROAD TO THE GEYSERS.

Headquarters at Mammoth Hot Springs to—		
Terrace Pass	3	
Rustic Falls on the West Gardiner	3	6
Indian Creek	3	9
Willow Park	6	15
Obsidian Cliffs	2	17
Lake of the Woods	4	21
Norris Geyser Plateau	7	28
Geyser Creek	4	32
Monument, Geyser Basin	2	34
Lower cañon and falls of the Gibbon	4	38
Cañon Creek	1	39
Junction with the southern route	6	45
Forks of the Fire Hole Rivers	5	50
Lower Geyser Basin	1	51
Midway Geyser Basin	4	55
House in Upper Geyser Basin	5	60

TRAIL AND PROPOSED ROAD TO THE YELLOWSTONE LAKE AND FALLS.

	Between points.	Total.
House in Upper Geyser Basin to—	*Miles.*	*Miles.*
Cascades of the Fire Hole Rivers	3	
Norris Pass of the main divide	5	8
Shoshone Creek, 2 miles from the lake		
Columbia River and Pacific waters	2	10
Two Ocean Pond	5	15
Hot Springs on Yellowstone Lake	7	22
Cliffs on lake	8	30
Bridge Creek Bay	12	42
Foot of Yellowstone Lake	5	47
Mud Volcano	8	55
Sulphur Mountain	4	59
Alum Creek	3	62
Great Falls of the Yellowstone	3	65
Return to Alum Creek	3	68
Hot Sulphur Springs	11	79
Mary's Lake	3	82
Cold Spring Creek	9	91
Forks of the Fire Hole River	7	98

MIDDLE GARDINER TRAIL.

Mammoth Hot Springs to—		
The West Gardiner	2	
Falls of the Middle Gardiner	2	4
Sheepeater Cliffs	2	6
Road to the Geysers	1	7

TRAIL TO FORKS OF THE YELLOWSTONE.

Mammoth Hot Springs to—		
Forks of the Gardiner	2	
Lower Falls of the east fork of the Gardiner	1	3
Upper Falls of the Gardiner	1	4
Cascades of the Gardiner	1	5
Black Tail Creek	3	8
Dry Cañon or Devil's Cut	7	15
Pleasant Valley	3	18
Forks of the Yellowstone	2	20

MOUNT WASHBURN TRAIL.

Forks of the Yellowstone to—		
Tower Falls	3	
Snowy spur of Mount Washburn	6	9
Dunraven's Pass	3	12
Cascade Creek	4	16
Great Falls of the Yellowstone	4	20

GRAND CAÑON TRAIL.

Tower Falls to—		
Bell's Lake	3	
Old Ruin	2	5
Grizzly Pass	2	7
Grand Slide	3	10
Brink of the Grand Cañon	4	14
Great Falls of the Yellowstone	3	17

MINERS' TRAIL TO THE CLARK'S FORK MINES.

	Between points.	Total.
Forks of the Yellowstone to—	*Miles.*	*Miles.*
Crystal Creek	4	
Amethyst Creek	4	8
Ford of East Fork of the Yellowstone	3	11
Soda Butte Medicinal Springs	2	13
Pebble Creek	3	16
Silver Smelter, Clark's Forks Mines, Index Peak	10	26
Index Peak	5	31

FOSSIL FOREST TRAIL.

Ford of East Fork of the Yellowstone to—		
Hot Spring Camp	2	
Fossil Terrace	3	5
Bison Summit	3	8
Mirror Pond	4	12
Brimstone Basin	8	20
Forks of Pelican Creek	4	24
Yellowstone Lake	6	30

STINKINGWATER TRAIL.

Forks of the Pelican to—		
Entrance to pass	6	
Cañon and pass through the first range	5	11

RECAPITULATION OF ROADS AND TRAILS OPENED WITHIN THE PARK.

Roads.

	Miles.
Mammoth Hot Springs to north line of the park, near the Yellowstone	6
Mammoth Hot Springs to the Forks of the Gardiner	2
Mammoth Hot Springs to West Gardiner	2
Mammoth Hot Springs to junction with Henry's Lake road	45
Junction on Henry's Lake road to western line of the park	13
Junction to house in Upper Geyser Basin	15
Forks of the Fire Hole Rivers to Cold Spring Creek	7
	90

Trails.

	Miles.
1st. Middle Gardiner	7
2d. Forks of the Yellowstone	20
3d. Clark's Fork Mines	31
4th. Fossil Forrests	30
5th. Stinkingwater	11
6th. Yellowstone Lake and Falls	98
7th. Mount Washburn	20
8th. Grand Cañon	17
	234

To the southern route the Central Pacific Railroad to California, as well as the Denver Pacific and other railroads to Saint Louis, afford great facilities for the Southern and Southwestern States and Territories, and for the increasing class of scientists and retired military and naval officers, or those upon leave of absence who, while making the grand trip of the world, now annually visit the park.

The northern route has the advantages of cool summer travel upon the great lakes, the Missouri and Yellowstone Rivers, and railroad connections with Manitoba and

other British possessions, and ecclong with Oregon, Washington Territory, and the northern route to Asia via the Northern Pacific Railroad.

One of these routes presents the greatest variety of scenery, modes of travel, and somewhat shortest distance; the other the most direct continuous railroad connection, least coach or horseback travel, and consequently requiring the least time, but practically both are convenient and necessary, as most persons with time and means will prefer going one route and returning the other, and no effort will be spared upon my part to prepare the roads within the park and urging others to prepare its approaches, as also to perfect arrangements with the various railroad, steamboat, and coach lines for trip tickets to and throughout the park, probably during the latter portion of the coming season, and certainly the next.

Camp outfit and provisions can be purchased without extortion at Bozeman, Virginia City, Ogden, and elsewhere, and trusty guides with saddle and pack animals at the Mammoth Hot Springs and other points within and adjacent to the park.

Time really necessary to view the leading wonders of the park, ten days, and many more may be enjoyed with benefit; season of the year for a visit, July, August, and early September; cost of trip, although one of the most important considerations with most persons, is, from their divers positions, tastes, and modes of travel, the most difficult to state, even approximately, but will range from $400 to $1,000 for the entire expenses of a visit to the mystic wonder-land. The best plan is, as recommended in my last year's report, to make the park the main object and turning point of a season's rambles, visiting at least the Salt Lake and the Yellowstone regions upon the outward or return routes.

There was no annoyance by Indians during the past season within or near the park, and no present prospect of any during the next.

YELLOWSTONE NATIONAL
PARK
MONTANA
IDAHO
WYOMING
CROW INDIAN RESERVATION
MADISON PLATEAU
GALLATIN RANGE
GALLATIN RIVER
MADISON RIVER
SNAKE RIVER
YELLOWSTONE LAKE
SHOSHONE LAKE
PITCHSTONE PLATEAU
ROAD TO HENRYS LAKE
CONTINENTAL DIVIDE
Department of the Interior.
COMPILED FROM THE MAPS OF F.V. HAYDEN AND OF P.W. NORRIS FOR 1878
AND FIELD NOTES OF THE EXPLORATIONS AND IMPROVEMENTS OF P.W. NORRIS AND SURVEYS OF A.J. REEVES IN 1879.
BY P.W. NORRIS SUPERINTENDENT OF THE YELLOWSTONE NATIONAL PARK